REMARKS

The above Amendments and these Remarks are in reply to the Office Action mailed 17 December 2007.

Claims 1-24 were pending in the Application prior to the outstanding Office Action. In the Office Action, the Examiner rejected claims 1-24. The present Response amends claims 1, 11, 19 and 22 and adds new claims 25 and 26, leaving for the Examiner's present consideration claims 1-26. Reconsideration of the rejections is requested.

I. THE REJECTIONS

The Examiner rejected all pending claims 1-24 as being either anticipated by, or obvious over, three references: Hashizume, Arai, and Hatanaka. Applicants will address the rejections of the independent claims over these references first, followed by the rejections of the dependent claims.

A. Rejection of Independent Claims 1, 19 and 22 under 35 U.S.C. §102(a/b) over Hashizume et al.

1. Independent Claim 1

Claim 1 has been amended to call for, among other things, "wherein the coupling strength of at least one said optical coupler monotonically decreases with increasing wavelength throughout the operational wavelength region of the component."

Hashizume, by contrast, teaches nothing about the wavelength dependence of the MMI couplers. The only wavelength dependence mentioned by Hashizume is in Fig. 3 and formula 1-4, but this is the wavelength dependence of the entire Mach-Zehnder Interferometer as a whole, not for any individual one of the MMI couplers. And even that wavelength dependence, as can readily be seen in Fig. 3, it is not monotonic in the operational wavelength region of the component (1530-1620nm).

Accordingly, Hashizume fails to teach at least one limitation of Applicants' claim 1, and therefore cannot anticipate. Claim 1 therefore should be patentable over Hashizume.

2. Independent Claim 19

Claim 19 calls for, among other things, each of the optical couplers to be "optimized to achieve a minimum polarization dependency of the said optical coupler."

Hashizume, by contrast, again teaches nothing at all about what his optical couplers are optimized for. They could easily be optimized for small size or easier manufacturability, for example, or for some other feature, any of which could easily yield a polarization dependency which is sub-optimal.

Accordingly, Hashizume fails to teach at least one limitation of Applicants' claim 19, and therefore cannot anticipate. Claim 19 therefore should be patentable over Hashizume.

3. Independent Claim 22

Claim 22 has been amended to call for, among other things, an optical coupler comprising two waveguides which are coupled together along one portion of their lengths by an MMI waveguide, and which are "in proximity with one another in at least one region immediately adjacent the MMI waveguide in which region the waveguides are substantially straight."

Examples of this can be seen in Applicants' Figs. 12(a), 12(b) and 12(c), in which the "substantially straight portions" are 53, 53a, 53b and the straight portions between MMI waveguides 55a and 55b.

By contrast, Hashizume does not show a coupler having straight portions immediately adjacent to his MMI waveguides. See his Fig. 1, for example, where in both regions immediately adjacent to an MMI waveguide (i.e. just upstream of the black rectangle and just downstream of the black rectangle), the waveguides bend away from each other. This is conventional for MMI couplers, and nothing in Hashizume teaches or suggests anything different for these couplers than what is conventional.

It may be that the Examiner is considering the Hashizume's waveguide arms 1 and 2 to satisfy the straight portion called for in Applicants' claim. But these portions are not "adjacent" to the MMI waveguide, which is only the black rectangle in Hashizume's Fig. 1.

Accordingly, Claim 22 should be patentable over Hashizume.

B. Rejection of Independent Claims 1, 19 and 22 Under 35 U.S.C. §102(b/e) over Arai

1. Independent Claim 1

As with Hashizume, Arai contains no teaching or suggestion of the limitation in Applicants' claim 1 of: "wherein the coupling strength of at least one said optical coupler monotonically decreases with increasing wavelength throughout the operational wavelength region of the component." Certainly none of the drawings cited by the Examiner teach this, nor do the three paragraphs of text cited by the Examiner.

In fact, Applicants believe that exactly the opposite is true in Arai: the coupling strength *increases* with increasing wavelength.

If the Examiner persists in this rejection, it is respectfully requested that the Examiner point out specifically where in Aria it is taught that "the coupling strength of at least one said optical coupler monotonically decreases with increasing wavelength throughout the operational wavelength region of the component."

Otherwise, it is respectfully submitted that Arai fails to teach an element called for in Applicants' claim 1 and cannot anticipate. Claim 1 therefore should be patentable over Arai.

2. Independent Claim 19

Like Hashizume, Arai does not teach that each of his optical couplers be "optimized to achieve a minimum polarization dependency of the said optical coupler." In fact, the example device he proposes does the opposite.

Arai is an example of typical prior art in which the erroneous assumption is made that one should target large gaps and small coupling strengths. Arai says as much in paragraphs [0011]-[0012], for example. Applicants have discovered that to achieve low polarization dependency, exactly the opposite is required. See Applicants' specification at p. 2, lines 10-20, where it is explained that "A big disadvantage of small coupling strengths is that a parameter which we refer to as the Relative Birefringence Error (RBE) becomes large, [which] gives a large polarization

dependence in the split ratio .... When two couplers are combined in a Mach-Zender configuration this manifests itself as a high polarization dependent deviation (>+0.2%) in the tap ratio."

In the device of his examples, in paragraph [0041], Arai chooses a large gap of 6.3 microns, which would actually yield a large polarization dependency. He could instead have chosen a smaller gap of 3.5 microns, which he says the prior art used in order to avoid unrealistically large device sizes; but he teaches away from that gap size in [0012] and produces a device with the larger gap size. As mentioned, this yields a worse polarization dependency, not an "optimal" one.

Accordingly, Arai does not teach that each of his optical couplers be "optimized to achieve a minimum polarization dependency of the said optical coupler."

Therefore, claim 19 therefore should be patentable over Arai.

3. Independent Claim 22

It is not clear that the Examiner has rejected claim 22 over Arai. The introductory sentence of Examiner's rejection over Arai, beginning in paragraph 5 of the Office Action, omits any mention of claim 22, but claim 22 is addressed in the body of the rejection.

To the extent the Examiner did intend to reject claim 22 over Arai, Applicants respond that claim 22 should be patentable over Arai for reasons similar to those set forth above with respect to Hashizume. In particular, Arai does not show a coupler having straight portions immediately adjacent to his MMI waveguides. In all of his drawings, both regions immediately adjacent to an MMI waveguide (i.e. just upstream and just downstream of the open rectangles 6 and 7), the waveguides bend away from each other. This is conventional for MMI couplers, and like Hashizume, nothing in Arai teaches or suggests anything different for these couplers than what is conventional.

Accordingly, claim 22 should be patentable over Arai.

C. Rejection of Independent Claims 1, 19 and 22 under 35 U.S.C. §102(e) over Hatanaka

As with the other references cited by the Examiner, Hatanaka contains no detail at all about the couplers in his Mach-Zehnder configuration, other than that they may be comprised of a directional coupler or a multimode interference coupler (col. 4, lines 62-64).

He does not teach or suggest anywhere that "the coupling strength of at least one said optical coupler monotonically decreases with increasing wavelength throughout the operational wavelength region of the component," as called for in Applicants' claim 1.

Nor does he teach or suggest anywhere that his optical couplers be "optimized to achieve a minimum polarization dependency of the said optical coupler," as called for in Applicants' claim 19. Polarization dependency is believed not even mentioned in Hatanaka.

Nor does he teach anywhere a coupler having straight portions immediately adjacent to any MMI waveguides, as called for in Applicants' claim 22.

If the Examiner persists in any of the above rejections, it is respectfully requested that he point out exactly where the above limitations are taught in the three cited references; Applicants have been unable to find any such teachings.

Accordingly, it is respectfully submitted that independent claims 1, 19 and 22 should all be patentable over Hatanaka.

D. Rejection of Dependent Claims 2-18, 20-21 and 23-24

The Examiner rejected claims 2-18, 20-21 and 23-24 as being either anticipated by or obvious over one or more of the three cited references.

These claims all depend ultimately from one of the independent claims 1, 19 or 22 and therefore are believed to be patentable for at least the reasons set forth above with respect to such independent claims. In addition, these claims each add their own limitations which, it is submitted, render them patentable in their own right.

Applicants have reviewed the grounds for rejection of these claims as stated by the Examiner and respectfully do not agree with the positions taken. Nevertheless Applicants do not believe it necessary to discuss their views on these claims further, since claims 1, 19 and 22 are

believed patentable as set forth above. Applicants respectfully reserve the right to present their further points regarding these claims should it become necessary in the future.

Accordingly, claims 2-18, 20-21 and 23-24 are believed to be patentable.

II. OTHER MATTERS AND CONCLUSION

The amendments to claims 1, 19 and 22 are made, and the new claims are added, to more particularly point out the invention. The amendment to claim 11 corrects a typographical error.

The references cited by the Examiner but not relied upon have been reviewed, but are not believed to render the claims unpatentable, either singly or in combination.

In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application should be allowable, and a Notice of Allowance is requested. The Examiner is respectfully requested to telephone the undersigned if he can assist in any way in expediting issuance of a patent.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Deposit Account No. 50-0869, under Order No. GEML 4671-3US, for any matter in connection with this response, including any fee for extension of time, which may be required.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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